

REMARKS

In view of the above amendments and following remarks, reconsideration of the rejections contained in the Office Action of November 25, 2003 is respectfully requested.

A number of minor editorial changes have been made to the specification and abstract to generally improve the form of the application.

Original claims 1-8 have now been canceled and replaced with new claims 16-23. Each of these claims clearly patentably distinguishes over both Mihara '273 and Perna '711.

The Examiner had rejected claims 1-5, 7 and 8 as being anticipated by Mihara '273. Further, claim 6 was rejected as being unpatentable over Mihara '273 in view of Perna '711. While Applicants do not acquiesce to the positions taken by the Examiner, nonetheless it has been deemed expedient to simply cancel these claims and replace them with new claims 16-23, corresponding generally to the prior claims. These claims are submitted to clearly distinguish over both these references for the following reasons.

The present invention is generally directed to a cleaning member used in a scrub cleaning process for semiconductor wafers. This type of process is illustrated by Fig. 4. In conventionally assembling a cylindrical cleaning element 52 on a rotary shaft 51, a lubricant was coated on the inner circumferential surface of the cylindrical cleaning element 52. The rotary shaft 51, having a larger diameter than the inner circumferential surface of the cylindrical cleaning element 52, is inserted from one end of the cleaning element 52. However, this subjects the cylindrical cleaning element 52, which is made of sponge, to undesirable deformation, sometimes resulting in rupture.

Thus the present invention provides a cleaning member which includes a cylindrical cleaning element having an axial through-hole and rotary shaft that is held in the through-hole with a press-fit. In making the cylindrical cleaning element according to the invention, the element is placed in a wet state, has its through-hole enlarged to a diameter larger than the diameter of the rotary shaft, and is then dry-set so as to form an enlarged cylindrical cleaning element. The rotary shaft is then easily inserted into the through-hole of the dry-set cylindrical cleaning element. Subsequently, the cylindrical cleaning element into which the rotary shaft has been inserted is wetted to contract the

diameter of the through-hole of the cylindrical cleaning element, thus providing a press-fit between the cylindrical cleaning element and the rotary shaft.

Thus, the cylindrical cleaning element 21a of the present invention, in a wet state, has an inner diameter d_3 which is smaller than a diameter d_1 of the rotary shaft 11. The cylindrical cleaning element 21b in a dry state has an inner diameter d_2 which is larger than the diameter d_1 of the rotary shaft 11. Note Figs. 1(a) and 1(b). Also note the discussion on page 6 of the specification.

In other words, the cylindrical cleaning element 21b, in a dry state, can be loosely fitted onto the rotary shaft 11. After fitting, while the cylindrical cleaning element 21 is caused to be wet, it is restored to its original contracted form.

Similar to prior claims 1 and 4, independent claim 16 is directed to a cylindrical cleaning element, and independent claim 19 is directed to a cleaning member which includes a cylindrical cleaning element. In both cases, these independent claims recite that the cylindrical cleaning element has a structure such that, when the cylindrical cleaning element is in a dry state, the through-hole has a diameter larger than the outer diameter of the rotary shaft, and when the cylindrical cleaning element is in a wet state and not on the rotary shaft, the through-hole has a diameter smaller than the outer shaft diameter of the rotary shaft, such that when the cylindrical cleaning element is in a wet state and on the rotary shaft, the rotary shaft is held in the through-hole with the press-fit. Such feature is not disclosed or suggested by the references cited by the Examiner.

Mihara et al. discloses a cleaning sponge roller made of polyvinylacetal-based porous sponge which has elasticity in its wet state. The object of Mihara et al. is to provide such a sponge roller with improved durability without a decrease in the quality of its cleaning performance. To achieve this, the invention primarily addresses the protrusions that are integrally molded on the outer surface of the roller. The specification of Mihara et al. only briefly discusses, in column 6, the fact that the roll body 3 is fixed to a rotating axis 7. However, there is no disclosure or suggestion of the roll body of Mihara et al. having a structure so that when it is in a dry state, its through-hole has a diameter larger than the outer diameter of its rotary shaft, and when in a wet state, its through-hole has a diameter smaller than the outer shaft diameter of the rotary shaft. Thus, there is no proper disclosure

or suggestion of the present invention as reflected by independent claims 16 and 19 from Mihara et al.

The additionally-cited reference to Perna discloses calendar roll wherein the shaft is knurled to eliminate slippage between the shaft and cover. The Examiner employed this reference to reject claim 6. However, Perna does not cure the deficiencies of Mihara et al. While the reference does address eliminating slippage between a shaft and a cover in a polyimide covered roll, it does not disclose the above-discussed distinctions of the present invention reflected by claims 16 and 19.

Accordingly, even if Perna could be combined with Mihara et al., any such proposed, combination would not result in the invention of claims 16 and 19.

For the above reasons, it is respectfully submitted to be clear that all of claims 16-23 clearly patentably distinguish over the prior art cited by the Examiner. Indication of such is respectfully requested.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact Applicants' undersigned representative.

Respectfully submitted,

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ABSTRACT OF THE DISCLOSURE

A rotary shaft having a predetermined diameter and a cylindrical cleaning element having an axial through-hole formed therein and ~~being~~ capable of being either in a wet state or a dry state are prepared. The through-hole has, in a wet state, a predetermined diameter smaller than ~~the~~ that diameter of the rotary shaft. The ~~cylindrical~~ cleaning element is ~~caused to be wet~~ wetted and the through-hole of the wet ~~cylindrical~~ cleaning element is enlarged so that it has a diameter larger than that ~~the diameter~~ of the rotary shaft. The enlarged ~~cylindrical~~ cleaning element is dry-set; and the rotary shaft is inserted into the through-hole of the ~~dry-set cylindrical~~ cleaning element. The ~~cylindrical~~ cleaning element ~~into which the rotary shaft has been inserted~~ is then wetted ~~wet~~, to ~~thereby~~ contract the diameter of the through-hole of the ~~cylindrical~~ cleaning element and provide a press-fit between the ~~cylindrical~~ cleaning element and the ~~rotary~~ shaft. A. ~~Consequently, a cleaning member comprising a cylindrical cleaning element and a rotary shaft held therein with a press-fit is obtained.~~